TOPAZ Vivacity™ V1.3

User's Guide

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Introduction

Topaz Vivacity™ is a set of Photoshop plug-ins that employs the state-of-the-art image processing technology. Its primary functions are to enhance images in the following areas:

1. Increase image resolution with better image quality than normal image resizing.

2. Suppress image noise caused by low lighting, high ISO settings, or film grain while retaining image details and sharpness.

3. Eliminate unwanted artifacts caused by JPEG, JPEG2000 and other types of image compression.

4. Improve image sharpness, details and edges without "edge rings" or noise amplification. It can also equalize images of improper filtering.

In addition, Topaz Vivacity™ can produce some interesting special effects:

1. Make images "flat" to resemble a painting.

2. Make images "curly" to resemble fantasy art.

Topaz Vivacity™ uses sophisticated algorithms that achieve far better results then the built-in resizing, sharpening or noise reduction filters in commercial image processing programs.

In the following sections we explain how to use Topaz Vivacity™ through examples. The *Topaz Vivacity™ context-sensitive help* provides a more detailed and systematic description of each filter and its parameters.

After understanding the basics of **Topaz Vivacity**™, you will find that it is quite intuitive and straightforward to use. However, the best way to become proficient is to experiment. The purpose of this guide is to go through a few enhancement cases to facilitate your own experimentation. Different situations will call for different settings.

Before You Start

Before start, a few things should be explained first.

The Topaz Vivacity™ Interface

All the filters in **Topaz Vivacity**™ use the same user interface layout, as shown in the following screenshot.

All the GUI items, such as buttons and parameter settings have **context-sensitive help**, which is disabled by default. To use context-sensitive help, check "**Enable popup help on each item**" box. Now if you place a mouse cursor on an item for one second, a help balloon will pop up and display help text for that item. Click the "**Help**" button to get an overall description of the filter.
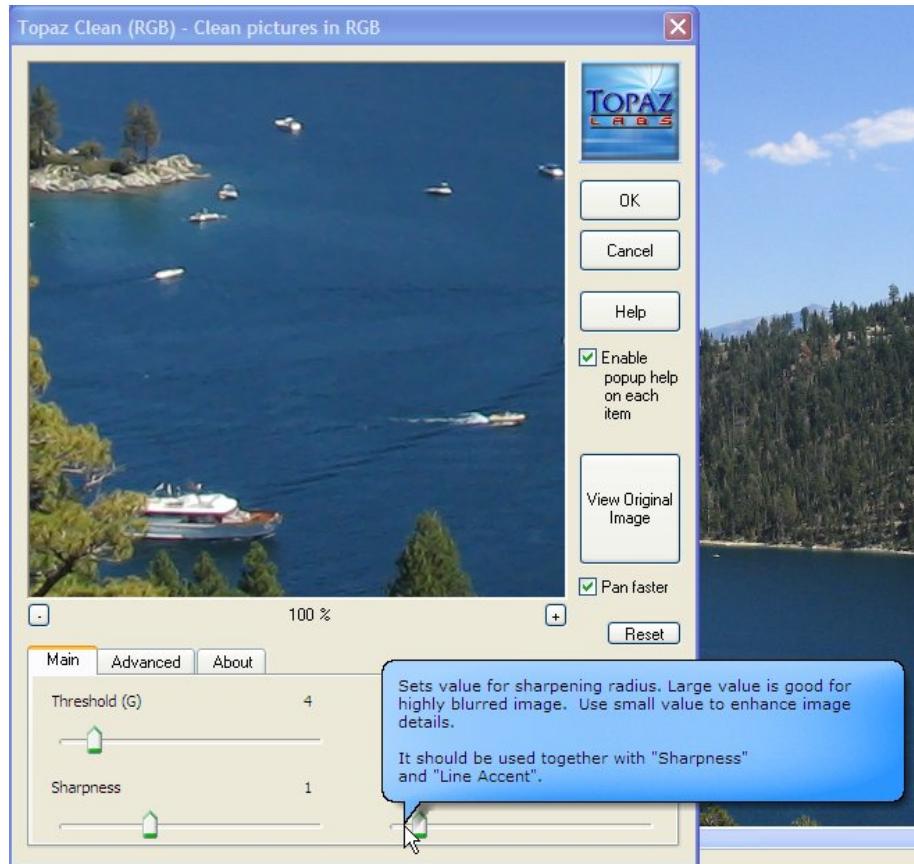
The **Preview window** always displays a portion of the **filtered image** by default.

To **pan the preview image**, click and hold the left mouse button on the preview image and drag it around. When you let go of the mouse button, the new portion of image will be processed according to the current settings and the result will be

displayed. The checkbox **"Pan faster"** controls the speed of the pan action. Check it to pan around a large image.

To **compare the filtered and un-filtered images**, click and hold the "**View Original Image**" button to switch to the unfiltered image. Letting go of the button will switch back to the filtered image. In this way, you can toggle the filtered and un-filtered image quickly to evaluate the effect of the current filter setting.

You can **zoom in** or **out** of the preview image using the **"+"**, or **"-"** buttons below the preview image. We find ourselves using the 200% setting most of the time. You will also find that the larger the zoom factor you use, the faster the image gets processed. This could be useful for some filter settings for which it takes a long time to update the preview image.

All the **filter's parameters** are in the tabbed panel under the image preview. Most filters have three tab pages. The **"Main"** page contains the most commonly used parameters. The **"Advanced"** page has additional parameters. Drag the slides in these pages to change filter parameters. Whenever you release the mouse button after dragging a slider, the preview image will be updated according to the new setting. The **"Reset"** button will return all parameters, including the ones not shown, to their default value.

For RGB image, some filters will have an addition tab pages which usually contains fine parameter adjustment relative to RGB channel or YCbCr parameters. This tab will not appear when the filter is used for gray or single channel images.

The **"About"** page contains the version information of the plug-in. It also has two buttons, one of which lets you email us directly. We would like to help whenever you have a question. We also appreciate any suggestions or comments and would really love to hear from you concerning how to improve **Topaz Vivacity**™. Please don't hesitate to email us. Your email address will be kept strictly confidential and we will not send unsolicited messages except for product updates. The second button will lead you to the **Topaz Vivacity page** of our website, which contains more updated information and other resources.

Image Modes

Photoshop and other host software support many image modes, such as Gray, RGB, LAB, CMYK, etc. Images can also be 8 bits per channel or 16 bits per channel. All **Topaz Vivacity**™ filters support **both 8 bits per channel and 16 bits per channel**.

All filters in **Topaz Vivacity**™ support the **RGB image format**. In addition, all except for **Topaz DeJPEG**™ and **Topaz DeJPEG2000**™ also support **Gray**, or single channel image. Therefore, you can work in an image mode of your choice, e.g., CMYK, and still use **Topaz Vivacity**™ on each channel separately. This can give you much more control and is preferred in certain situations.

Suppress Image Noise

Noise is very common in images taken by both digital cameras and film cameras. Even high-end professional cameras can produce images with a high level of noise at low light or high ISO settings.

Topaz Vivacity™ offers three filters, **Topaz Clean™**, **Topaz Clean (YCbCr)™,** and **Topaz DeNoise/EQ™** for cleaning up noise from images. **Topaz Clean™** and **Topaz Clean (YCbCr)™** use a unique structural enhancing filter that remove noise and increase the crispness of edges at the same time. **Topaz DeNoise/EQ™** is a noise filter based on *wavelet transformation*. It tends to create smooth looking images. Which filters to use depends on the image content and your intention.

Use Topaz Clean™

Here is a high resolution image taken by an OLYMPUS SLR digital camera at 3264x2448 resolution and ISO1600. It's a nice picture but strong noise is visible upon detailed examination.

The first figure in the next page is a small portion of this same image viewed at original resolution. The noise caused by high ISO is obvious. This picture is essential unusable if you want to print it out at 8x11" or larger, Apply **Topaz Clean**™ with the following parameter settings, you get the image with much less noise and clear edges.

Topaz Clean™ Parameter Setting used in the Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Threshold**	**8.0**	**4.0**	**This is the level below which noise get suppressed**
	Clean Radius	**5.0**	**4.0**	**Specifies the neighbor pixels that are used in cleaning**
	Sharpness	1.16	1.0	Sharp the image slightly to make it looks better
	Sharpness Radius	0.75	1.0	
Advanced	**R Threshold vs. Main**	**1.3**	**1.0**	**The noise level is higher in RED channel relative to Green, or main channel.**
	B Threshold vs. Main	**1.2**	**1.0**	**The noise level is higher in BLUE channel comparing to Green, or main channel.**
	Line Accent	0.4	0.8	See Topaz Sharpen™ for details
	Iterations	1	1	Number of passes the filter is applied.

A portion of image viewed for details. You can clearly see the noise due to high ISO setting.

Same image after Topaz Clean™. You can see that the noise is effectively suppressed. Moreover, the image becomes more clear and crisp.

Topaz Clean™ is designed to clean up noise from RGB images. Unlike most modem noise removal techniques that mostly based-on wavelet approach, **Topaz Clean**™'s unique approach allows you to achieve excellent results without calibration camera to create "noise profile", or fiddling with a large number of parameters. Moreover, it creates crisp looking edges and reduces color bleeding.

There are only two key parameters, "**Threshold(G)**" and "**Clean Radius**". "**Threshold**" sets a level under which small random features are considered to be noise and tend to be filtered out. The "**Clean Radius**" specifies the radius of a circle inside which pixels affects the cleaning result. For noisier images, use higher "Threshold" and "Clean Radius". However, do not use a "Threshold" value higher than necessary, as this could result in useful image details being suppressed.

You can apply different thresholds on R, G, and B channels. Use **"R Threshold vs Main"** and **"B Threshold vs. Main"** to adjust the relative values of the threshold for the red (R) channel and blue (B) channel. In our example, "**R Threshold vs Main"** is 1.3 since the red channel has much more noise than the green one, which is the main channel. Setting this value to 1.3 allows more suppression of red channel noise, resulting in a better result. To examine noise levels in each channel, use the **"Channel" tab page** in Photoshop to view each channel separately. Other hosts have similar methods.

Topaz Clean™ also contains a set of parameters that sharpens the image at the same time. These parameters are "**Sharpness**", "**Sharpness Radius**", and "**Line Accent**". They are basically a simplified version of **Topaz Sharpen™** integrated here for your convenience. Detailed explanations of each can be found in the section **Sharpen Images**.

"**Iterations**" specifies how many times the filtering be repeated. Applying **Topaz Clean**™ more than one times can achieve results that are not achievable with one iteration. In the images on the next page, **4 iterations** are used to have this "overly clean" effect:

Topaz Clean(YCbCr)™ performs similarly to **Topaz Clean™**. The difference is that **Topaz Clean(YCbCr)™** works internally in YCbYr color space. Both **Topaz Clean™** and **Clean(YCbCr)™** can work in **gray image mode**. Therefore, it can be used to process the image in any mode, channel by channel.
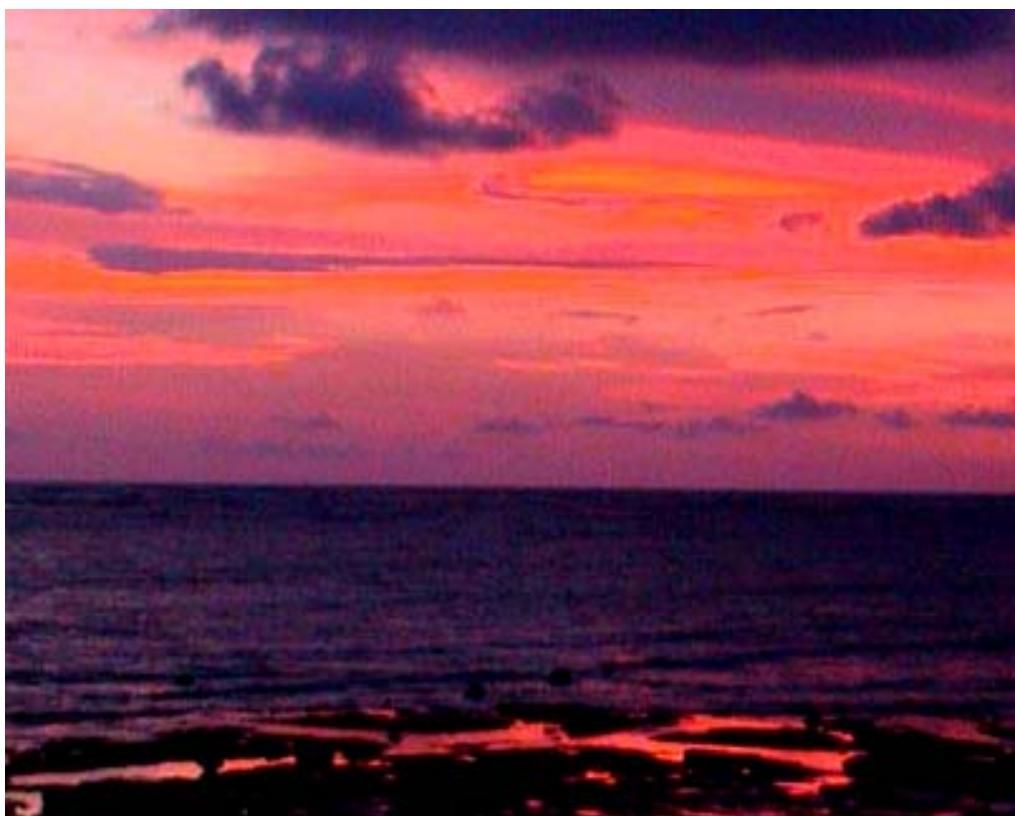
Original image.
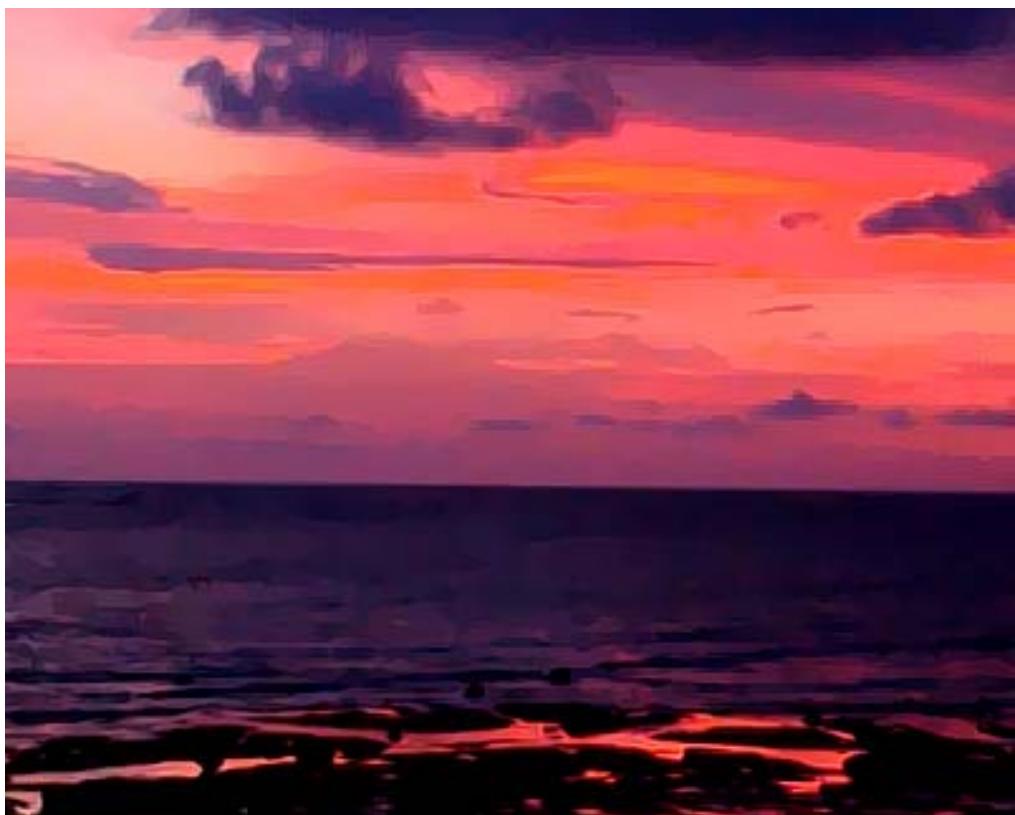
Filtered by Topaz Clean™ using 4 iterations to achieve a superior cleaning effect.

Using Topaz DeNoise/EQ™

Topaz Vivacity™ has another noise reduction filter, **Topaz DeNoise/EQ™.** This filter is based on wavelet transformation. Unlike other advanced noise reduction software that needs a "noise profile", **Topaz DeNoise/EQ™** is easy to use and produces very good results.

The major difference between **Topaz DeNoise/EQ™** and **Topaz Clean™** is that **Topaz DeNoise/EQ™** tends to produce smoothing looking results while **Topaz Clean™** tends to produce sharp but slightly faceted images. For image with a small amount of noise, the difference is minor. For image with severe noise, however, you should select the one that produces your intended results.

The picture shown here is a scanned image with a lot of noise. By applying **Topaz DeNoise/EQ™**, we immediately make it a much nicer portrait.

The picture in the next page shows the same image filtered by **Topaz Clean™**.

You can see that both filters do a pretty good job at suppressing

random noise while preserving image details. However, the image filtered by **Topaz DeNoise/EQ™** looks more smooth and natural. This feature makes it good for portraits. The edge is soft and smooth. In contrast, the image filtered by **Topaz Clean™** looks sharp and more detailed. However, its edges are jagged and faceted, and otherwise less natural.

You may also want to use **Topaz DeNoise/EQ™**, instead of **Topaz Clean™** when your picture has very severe noise and large areas supposed to be smooth, e.g., sky. **Topaz DeNoise/EQ™** can produce much better smooth area than **Topaz Clean™**. On the other hand, if your picture has a lot of details, **Topaz Clean™** may suit you better.

Topaz DeNoise/EQ™ Parameter Setting used in the Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Noise Threshold**	**8.65**	**4.0**	**This value is intentionally set to a little high to produce the smooth looking effect on the face.**
	Sharpness	1.11	1.0	Sharp the image slightly to make it looks better
	Noise Suppression	0.9	0.9	
Adva nced	**N. Thd Adjust.**	**1.3,1.0, 0.9**	**1.0, 1.0, 1.0**	**Increase the threshold at coarse (Radius=6) scale to make it very smooth looking.**
	Sharpness adj.	**0.0, 0.0, 0.78**	**0.0, 0.0, 0.0**	**Increase the fine scale (Radius=1) sharpness so that the result looks a little sharper.**
	Hardness	0.5	0.5	Default

Reduce JPEG Artifacts

Most digital images are stored as JPEGs. JPEG allows you to compress the original image into a much smaller file size. However, this does come at a price: **JPEG artifacts**. If an image is highly compressed, JPEG artifacts become quite obvious. Even if an image is not compressed at a high ratio, the JPEG artifacts can become quite obvious when it is enlarged or sharpened.

The image at the top shows, at 200% zoom, a portion of an image compressed with JPEG quality of 25 (out of 100). The JPEG compression artifacts are quite obvious. In the blue sky you can see the tell-tale "blockiness" of JPEG compression. At sharp edges such as the windmill and tree line, there are small speckles around the edges. These are very typical instances of JPEG compression artifacts.

Topaz DeJPEG™ can effectively suppress JPEG compression artifacts. Just apply the filter and set "**Suppression**"

to 80 (keeping the rest of the parameters at default values). You will immediately see that all the JPEG artifacts are gone. The figure below the original image is the filtered image using **Topaz DeJPEG**™.

The filtered image sometimes tends to look a little bit soft. Change the "**Sharpen**" to 1.5 to compensate for the loss in sharpness. The table below is the complete filter parameter setting.

Topaz DeJPEG™ Parameter Setting used in the Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Suppression**	**80**	**20**	**This is the main parameters that control compression.**
	Sharpness	1.5	1.0	To compensate for sharpness loss
Advanced	JPEG colorspace	default	YCbCr 411	Should be set to the same color space used by original JPEG image, most of them should be YCbCr411
	Best quality/slow	default	No	Check this option to product better result, but 4 times slower.
	Sharpen Radius	default	1.0	See Topaz Sharpen™ for details
	Edge Crispness	default	1.0	See Topaz Sharpen™ for details

Topaz DeJPEG™ is very straightforward. There is only one key parameter, "**Suppression**". The higher the value, the more JPEG artifacts it can suppress. However, do not set it higher than necessary since it also makes images softer.

To compensate for the softness due to JPEG artifact suppression, **Topaz DeJPEG™** integrates a simplified version of **Topaz Sharpen**™. This sharpening function is controlled by three parameters, "**Sharpness**" in the "Main" tab page, "**Sharpen Radius**" and "**Edge Crispness**" in the "Advanced" page. Please refer to section Sharpen Images for more detailed discussion. In many cases, **Topaz DeJPEG™** alone can produce satisfactory results. In other cases, especially when the original images are highly compressed; you may want to take the full advantage of the more advanced **Topaz Sharpen**™. In this case, leave the "sharpness" and edge crispness value at 1.0 (default value) and apply **Topaz Sharpen**™ after **Topaz DeJPEG**™.

For images compressed with JPEG2000, Topaz Vivacity™ contains another filter, Topaz DeJPEG2000™, that is specifically designed to reduce JPEG2000 artifacts. Usage is similar.

Sharpen Images

Topaz Sharpen™ is a powerful filter that can increase the sharpness of an image. Unlike other sharpening filters, it can do so without the usual overshooting, ringing edges, or noise amplification. In addition, it can be used to reduce aliasing and achieve other effects.

The image on the top has a slight blur caused by bad focus. Apply the **Topaz Sharpen™** filter and set the parameters as indicated in the table in the next page. The result at the bottom is a lot better. As you can see, **Topaz Sharpen**™ effectively enhances the image sharpness and produces a natural-looking result.

There are eight parameters in total that control the different aspects of **Topaz Sharpen**. "**Sharpness**" controls the overall sharpening. This parameter has behavior similar to a regular sharpen filter. An inappropriately high value will produce overshooting or a "ringing edge".

Topaz Sharpen™ Parameter Setting used in the Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Sharpness**	**2.4**	**20**	**Control the overall sharpening, it is pretty high since radius is small**
	Edge Crispness	**2.5**		**This make the picture even sharper with no overshooting**
	Radius	**0.7**		**The size of blur, 0.7 pixel in our example.**
	Noise threshold	**1.5**	**1.0**	**Any edges or noise below this value will not be sharpened**
Adva nced	**Line Accent**	**0.5**	**0.0**	**Add a little of Line Accent can reduce unnatural edges and noise.**
	Horizontal Aliasing Reduction	default	0	
	Vertical Aliasing Reduction	default	0	
	Iterations	default	1	

"**Radius**" controls the size of edges to be sharpened. It should be set according to the size of the blur. In our example, the blur is not severe; therefore a small value of 0.7 is used. Larger values should be used for more severe blur situation. However, a larger radius tends to destroy small details.

"**Edge Crispness**" is a unique capability of **Topaz Sharpen**™ which synthesizes crisp edges of images. Higher value will produce more crisp edges without the ringing edges or overshooting. However, an overly high value may produce unnatural images.

"**Line Accent**" is another very unique capability of **Topaz Sharpen**™, which *emphasizes* line features. The filter examines the image for lines and accentuates these lines according to the "Line Accent" setting. Proper use of this parameter can produce smooth looking edges and reduce noise at the same time. Again, an overly high value may produce unnatural images.

"**Horizontal Aliasing Reduction**" works together with "**Line Accent**". It reduces the aliasing effect on strong horizontal edge lines. Horizontal aliasing can be identified as "staircase" horizontal lines or edges, instead of smooth horizontal lines. You must set "**Line Accent**" to high value, e.g. >0.5, for this feature to be effective.

"**Vertical Aliasing Reduction**" is similar to "Horizontal Aliasing Reduction", except it works for vertical lines.

"**Iterations**" enables you to process the image through **Topaz Sharpen™** multiple times. These will enable you to strengthen the effect of **Topaz Sharpen**™.

Correct Edges

There are cases where image edges have ringing effects, as the illustrated in the picture below. Notice the overshooting edges around the windows and tree. This type of problems is generally caused by previous improper sharpening operations or bad camera optics.

To correct this type of problem, we can explore the multi-scale wavelet processing of **Topaz DeNoise/EQ™**.

Topaz DeNoise/EQ™ has parameters in the "Advanced" settings tab that can selectively increase edge sharpness at different sizes. We can use this capability to correct the edges in the image.

The second picture is the result of **Topaz DeNoise/EQ™** filter. We can see that the "ringing effect" of the

original picture is largely corrected.

The parameter settings are shown in the following table. The key to effective edge correction is to experimentally select proper "Sharpness" and "Sharpness adjustment" at different sizes.

Topaz DeNoise/EQ™ Parameter Setting used in the Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Noise Threshold**	**0.0**	**4.0**	**We don't do denoise at all here**
	Sharpness	**0.56**	**1.0**	**Here we reduce the overall sharpness to correct the ringing edges.**
	Noise Suppression	0.9	0.9	No need for denoise
Adva nced	N. Thd Adjust.	1.0, 1.0,1.0	1.0, 1.0, 1.0	No need for denoise
	Sharpness adj. at radius=4,2,1	**-0.64, -0.45 0.71**	**0.0, 0.0, 0.0**	**This is the key to get the best edge correction. These values are adjusted experimentally so that the ringing effect is minimum while still maintaining image details.**
	Hardness	0.5	0.5	Default

Enlarge Images

Enlarging an image by the resize function in Photoshop or another software will increase the number of pixels in the resulting image. However, the result image is not high quality and usually looks soft and blurry. Moreover, previously unnoticed imperfections of the image, such as noise and compression artifacts, will show up more clearly in the enlarged images.

Topaz Enlarge2X™ is designed to double image resolution. As an example, here is a small image in its original size.

Topaz Enlarge2X™ requires two steps to double the resolution of this image:

1. **Resize the image to exactly 200% using "Nearest Neighbor" re-sampling.**
2. Apply **Topaz Enlarge2X™** filter to the resized image.

Now let do the example step-by-step. In Photoshop, use the resize function in **Image->Image Resize…** You will see the resize dialog. You need to do the following:

1. Change both **width and height to exactly 200%.**
2. Make sure to check **"Resample Image"** and select **"Nearest Neighbor".**

This step is very important since **Topaz Enlarge2X™** can only work on an image exactly doubled in size with pixel duplication. Failure to do so will result in a less optimal result.
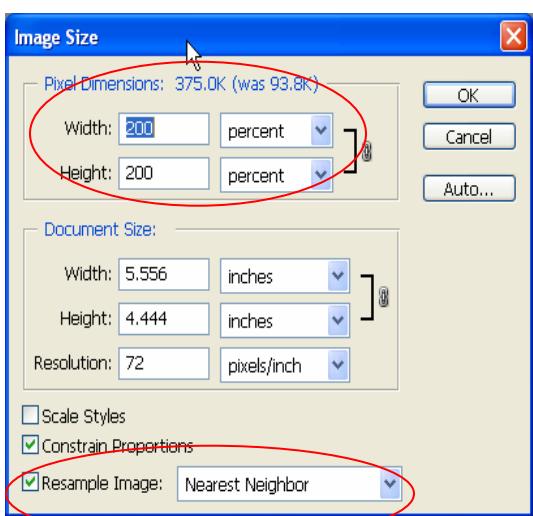
Now you see the small image's size is doubled. The enlarged image looks blurry with jagged edges. In addition, the previously unnoticeable noise (on the blue sky area) is more noticeable.

After applying Topaz Enlarge2X™, with the following parameters, you will get a much better high resolution image.

Topaz Enlarge2X™ Parameter Setting used in the "Enlarge" Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Threshold**	**3.8**	**2.0**	**Suppress noise and reduce jagged edges.**
	Sharpness	**1.8**	**1.5**	**Make the result look sharp.**
	Sharp Radius	**0.9**	**0.8**	**The edge enhancement radius**

The result isn't perfect, but it's definitely better than a normal resize. Here we want to show that **Topaz Enlarge2X™** provides you a tool to enhance resized image to a usable level.

In fact, the enlargement process has been pre-recorded into a few **Photoshop actions** to make it easy to use. Here is how to use the actions to increase the example image 3.5 times:
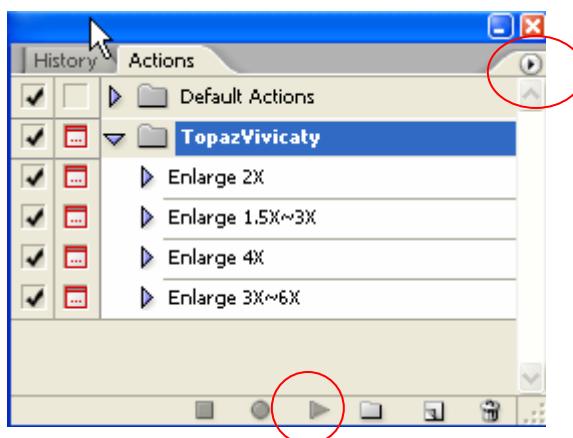
1. **Load TopazVivacity action:** select the **Photoshop Actions** panel and click the small arrow on the top-right corner. This will invoke the list of menu items related to actions. Select **"Load Actions…"** and browse to Topaz Vivacity installation directory, e.g., "C:\Program Files\Adobe\Photoshop CS2\Plug-ins\topazvivacity", and open **"TopazVivacity.atn".**

Now you will see **Topaz Vivacity** in the action panel. You only need to do this one.

2. **Apply "Enlarge 2X~6X" Action:** highlight "Enlarge 3X~6X", and click the play button. This will let start a sequence of actions that apply twice the resize/enlarge2X operation to first increase the resolution to 4X and then another resize to reduce it to 3.5 times.

It is theoretically impossible to recover additional image details via any type of resize or enlargement. **Topaz Vivacity**™, or any other software for this matter, cannot break this theoretical limitation. However, what Topaz Vivacity™ can do is to make the enlarged image look better visually. It sometimes can produce visually detailed images that seem to have higher resolution.

Moreover, other files in Topaz Vivacity™ can be used together to produce higher resolution images. For example, you may first use Topaz DeJPEG™ to reduce the compression artifacts before doubling the image resolution. Or you can apply Topaz DeNoise/EQ™ after resolution increase to further reduce the image noise.

Create Special Effects

The primary focus of Topaz Vivacity™ is image enhancement. However, some filters can be used to achieve interesting effects.

The top image is a picture of a rain forest. It is nice but plain. Now apply **Topaz Sharpen**™ and you get a more interesting image.

The key to create this effect is to overly use the "**Line Accent**" capability of **Topaz Sharpen**™. We use a large number of "iterations", 4 in this case, to make the line features dominate the whole image. (The parameters setting can be found at the end of this section.)

Here is another example of another special effect achieved using **Topaz Vivacity**™. This time, **Topaz Clean**™ is used for its ability to suppression image details.

In this example, the original picture, at the top, is transformed into a painting-like image at the bottom. Here, a high "Threshold" value and multiple iterations suppress most of the image details but leave major features intact.

Again, the effect is achieve by using a side effect of **Topaz Clean**™, which suppresses noise and details to some degree under the "Threshold" value. In addition, the "Line Accent" also contributes to the smooth looking effects.

Actually combining the ability of these two can produce both flat and line-art type of effects. The images in the next page illustrate an example. The top image is the original and the bottom image is the filtered one using **Topaz Clean™.**
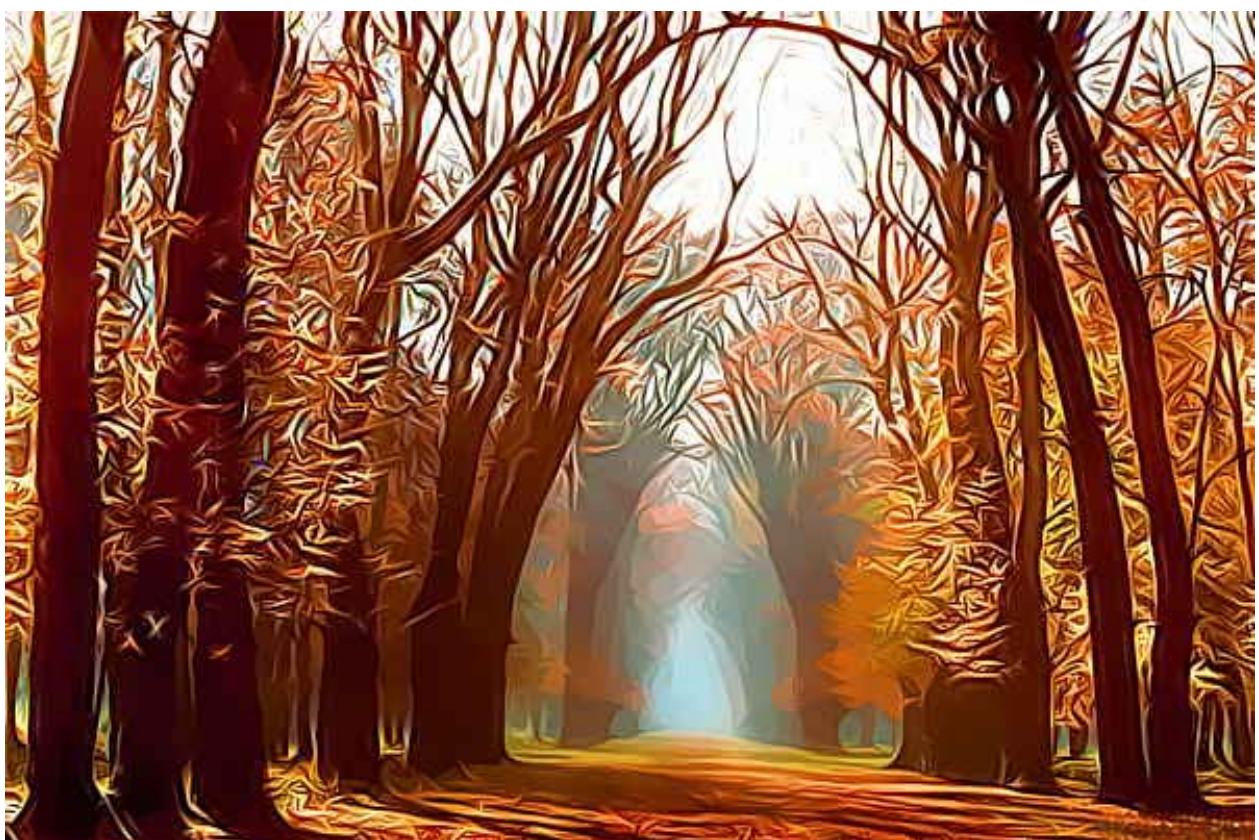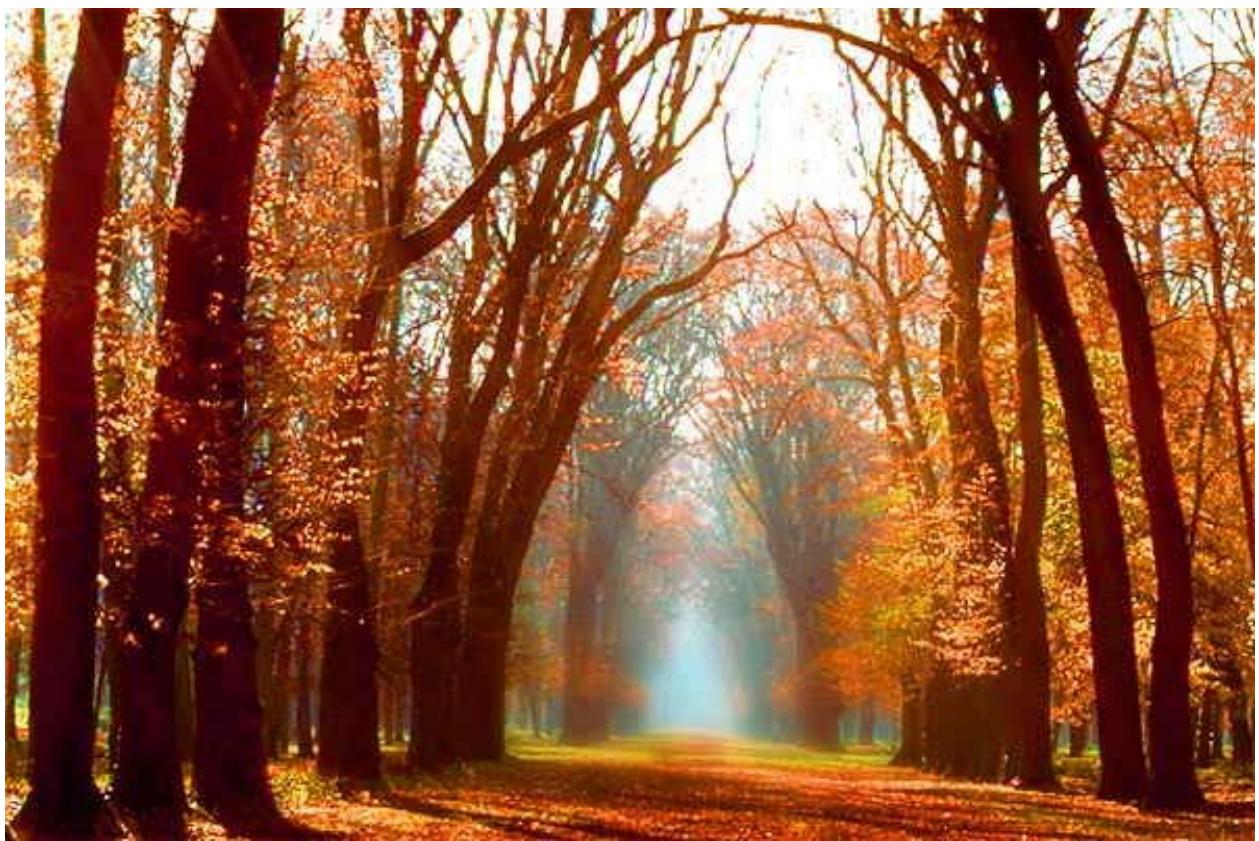
Here are the complete parameters settings for the above examples:

Topaz Sharpen™ Parameter Setting used in "Forest" Example				
Tab	**Parameters**	**Value**	**Default**	**Comment**
Main	**Sharpness**	**1.0**	**1.2**	**Don't want to sharpen the picture**
	Edge Crispness	**0.0**	**1.0**	**Don't make it crisp**
	Radius	**2.3**	**1.0**	**Large value make the line thicker**
	Noise threshold	**0**	**1.0**	**No need to suppress noise specifically**
Adva nced	**Line Accent**	**1.0**	**0.0**	**This is the key!**
	Horizontal Aliasing Reduction	default	0	
	Vertical Aliasing Reduction	default	0	
	Iterations	**4**	**1**	**Need 4 iterations to achieve the strong line effect**

Topaz Clean™ Parameter Setting for "Jet" example			
Parameters	**Value**	**Default**	**Comment**
Threshold	**7.2**	**4.0**	**High value to suppress details**
Clean Radius	**6.0**	**3.0**	**Large to make it more flat looking**
Sharpness	default	1.0	No sharpening
Sharpness Radius	Default	1.0	
R Threshold vs. Main	default	1.0	
B Threshold vs. Main	default	1.0	
Line Accent	default	0.8	
Iterations	**8**	**1**	**Set the iterations to maximum**

Topaz Clean™ Parameter Setting for "Fall" example			
Parameters	**Value**	**Default**	**Comment**
Threshold	**15**	**4.0**	**High value to suppress most of the details**
Clean Radius	**6.0**	**3.0**	**Large to make it more flat looking**
Sharpness	default	1.0	
Sharpness Radius	**2.9**	**1.0**	**Large radius make the effect more obvious**
R Threshold vs. Main	default	1.0	Should be set to the same color space used by original JPEG image, most of them should be YCbCr411
B Threshold vs. Main	default	1.0	Check this option to product slightly better result, at the cost of 4 times slower.
Line Accent	**1.0**	**0.8**	**Maximum Line accent**
Iterations	**6**	**1**	**More iteration to strengthen the effect**

Summary

In this User's Guide, we explained how to effectively use different filters in **Topaz Vivacity**™ for noise suppression, sharpness enhancement and special effects. Through use examples, we hope that you understand the fundamental mechanisms powering **Topaz Vivacity**™ and effectively use them in your work.

After understand the basic ideas behind different filters of **Topaz Vivacity**™, we encourage you to experiment with different parameters settings in different situations. In fact, the best way to master **Topaz Vivacity**™ and achieve its full potential is to experiment.

If you have any questions, comments, or suggestions, please email us at topazvivacity@topazlabs.com.